Technology Products of the PHAiRS REASoN Project – Year 2 Web Services and Demonstration Interfaces Development

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Presentation Outline

- Overall Project Goals

- Year 1 Foundation

- Year 2 Accomplishments

  ❖ Services Oriented Architecture

  ❖ Demonstration Interface

- Future Developments

Project Goals

Enhance public health decision-making through the delivery of relevant information to public health officials through existing decision support systems.

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- The information provided by this project includes:

  - $PM_{2.5}$ and PM_{10} particulate forecasts, generated by the DREAM model, and improved through the integration of NASA data into the model

  - Ground measurement data from the EPA AIRNOW network

  - Analytic results in support of effective summarization and analyses useful to the public health community

Project Goals

Enhance public health decision-making through the delivery of relevant information to public health officials through existing decision support systems.

- Development of a Services Oriented Architecture that supports the delivery of products that may be embedded into existing decision support systems. For example:

  - Rapid Syndrome Validation Project (RSVP) - Sandia National Laboratories

 - Syndrome Reporting Information System (SYRIS) - ARES Corporation

Year 1 Foundation

- The first year of technology development for the PHAiRS project emphasized the following:
    - ❖ Data acquisition and processing
    - ❖ Sample product generation
    - ❖ Basic online analytic tools
    - ❖ Version 1 of the client interface that illustrates the various data and analytic capabilities of the application framework
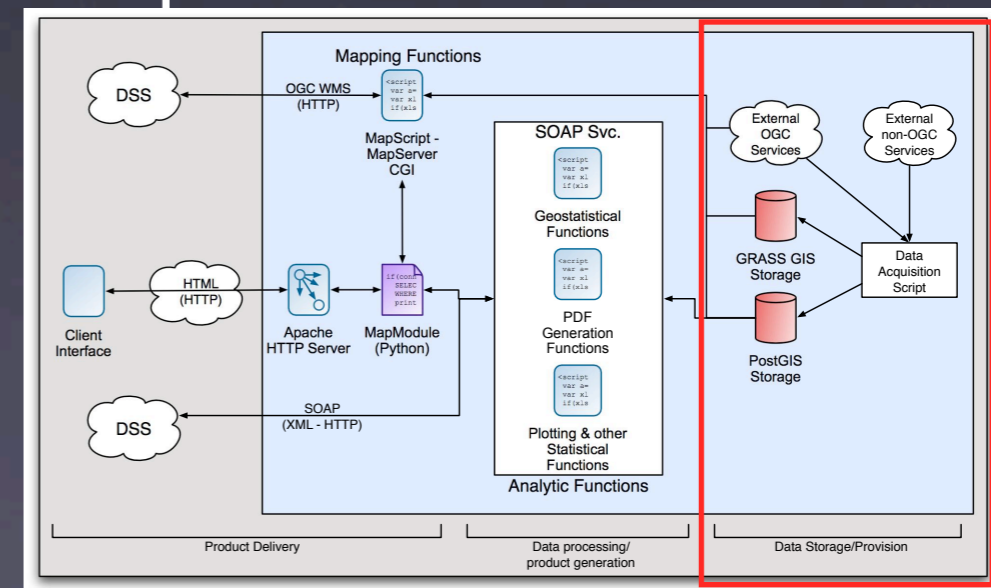
Year 2 Accomplishments

- Year 2 of the PHAiRS project builds on the first project year by producing a Services Oriented Architecture (SOA) that consists of:

  - ❖ Enhanced raster and vector data management capabilities

  - ❖ Integration of sample products of the DREAM model into the visualization and analysis system

  - ❖ Analytic tools as SOAP services that may be called either from the demonstration interface or from other clients (i.e. DSSs)

  - ❖ Time-enabled OGC Web Map Services developed as part of the overall services oriented architecture

  - ❖ A demonstration interface that exemplifies how the developed services may be deployed within a web client

Overview
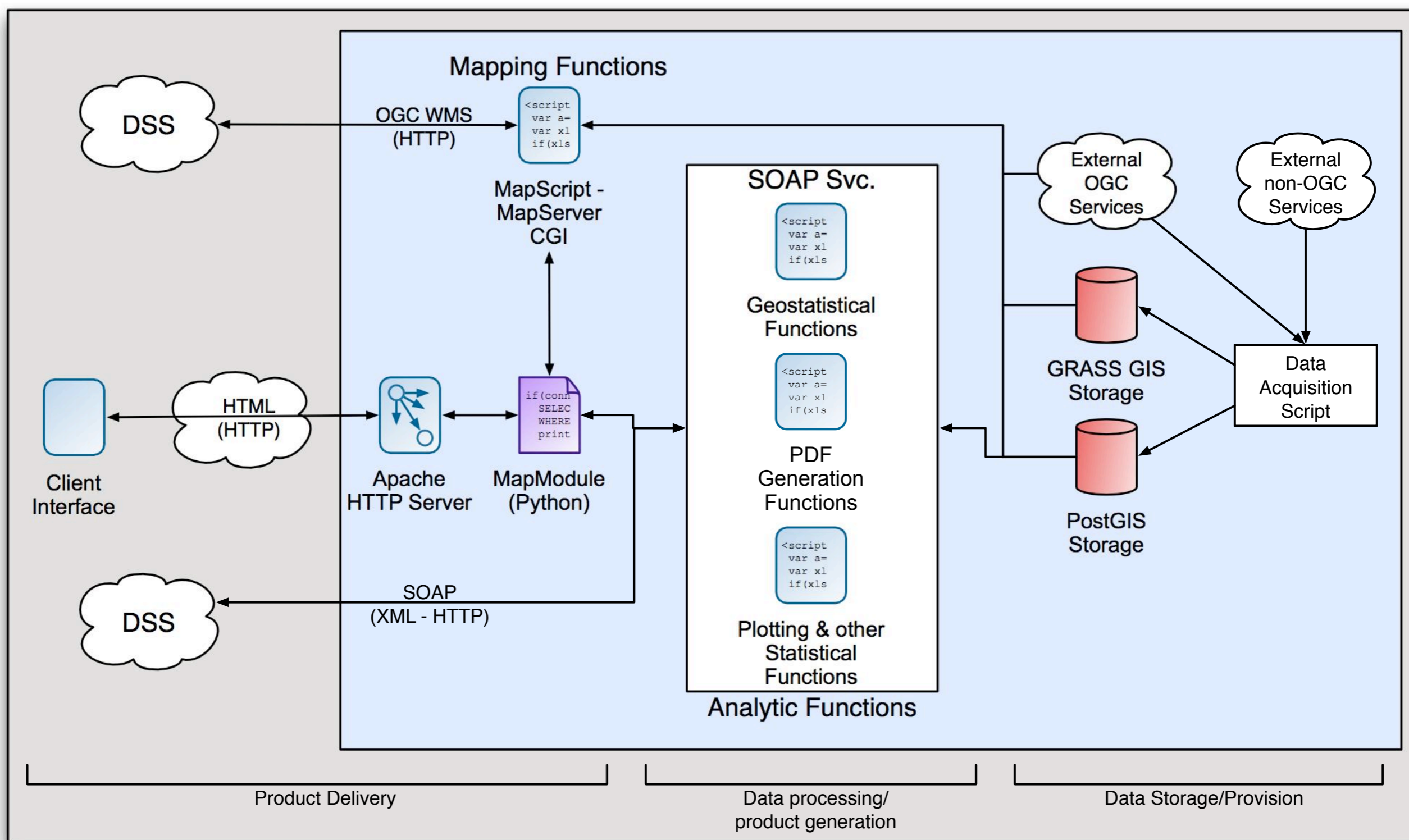
Data Management and Processing

- External Data/Service Providers

  ❖ OGC Enabled: DataFed

  ❖ Non-OGC: NOAA/NWS, Land-Process DAAC

- Automated data acquisition through scheduled Python and shell scripts

- Data stored in PostgreSQL/PostGIS (vector data), GRASS GIS (raster data)

  ❖ Boundaries, cities, land ownership Transportation networks, Hydrography, other environmental data

  ❖ EPA AirNow Particulates

  ❖ DREAM model outputs

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Public Health Applications in Remote Sensing

Product Generation

- Two service models are used to generate products:
  - ❖ Open Geospatial Consortium Web Map Services (WMS)
  - ❖ W3C Simple Object Access Protocol (SOAP)

- WMS services provide images of data, including time-sensitive data (e.g. EPA AirNow particulate data), through the simple WMS URL specification

- The WMS services are provided by a customized build of Minnesota MapServer running as a CGI application, that accesses data stored in GRASS GIS and PostgreSQL/ PostGIS.

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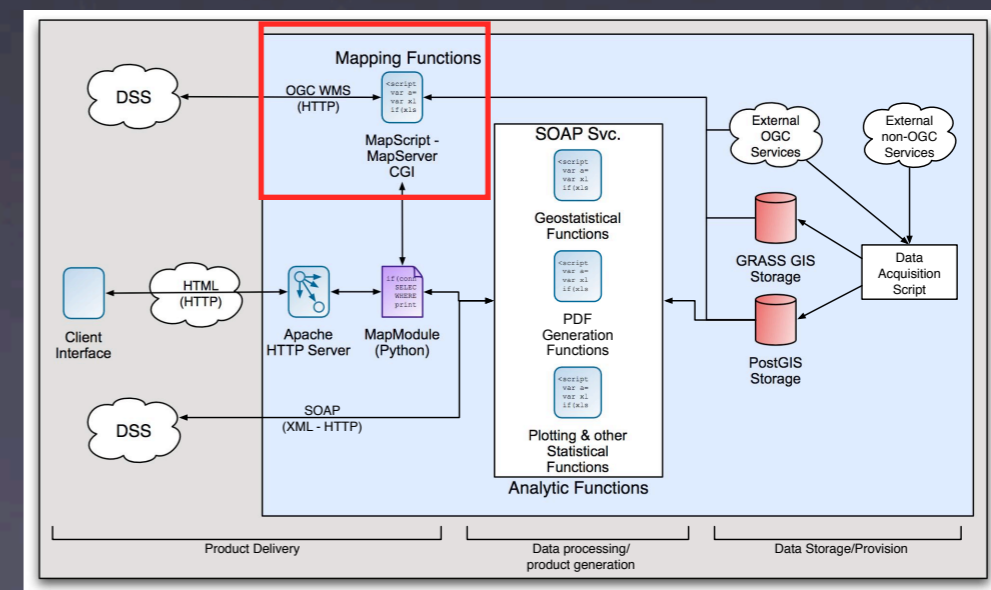
Product Generation

- The current suite of SOAP services provide three capabilities:
    - ❖ Time series components
        - ◉ Frame Image URLs (WMS requests)
        - ◉ Time series plot (URL for a custom generated PNG file)
    - ❖ Geostatistical analysis functions
        - ◉ Summarization over irregular regions, represented as a density plot
    - ❖ High-quality hardcopy map/document production
   - ◉ PDF file generation
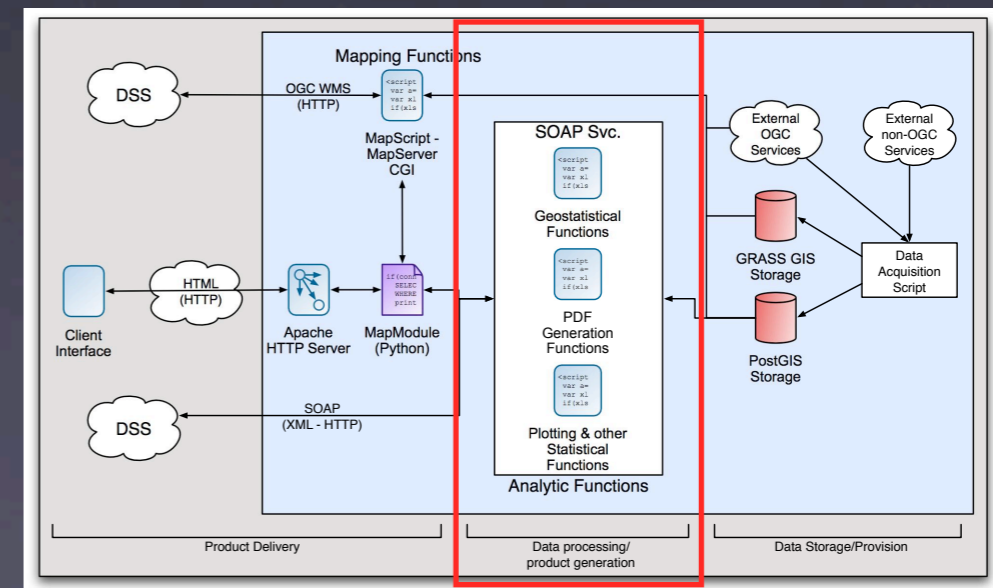
Product Delivery

- Product delivery is provided through the standards-based interfaces described previously, and through the demonstration client web interface

- The WMS and SOAP specifications support simple integration of PHAiRS products into external applications, such as the RSVP and SYRIS decision support systems.
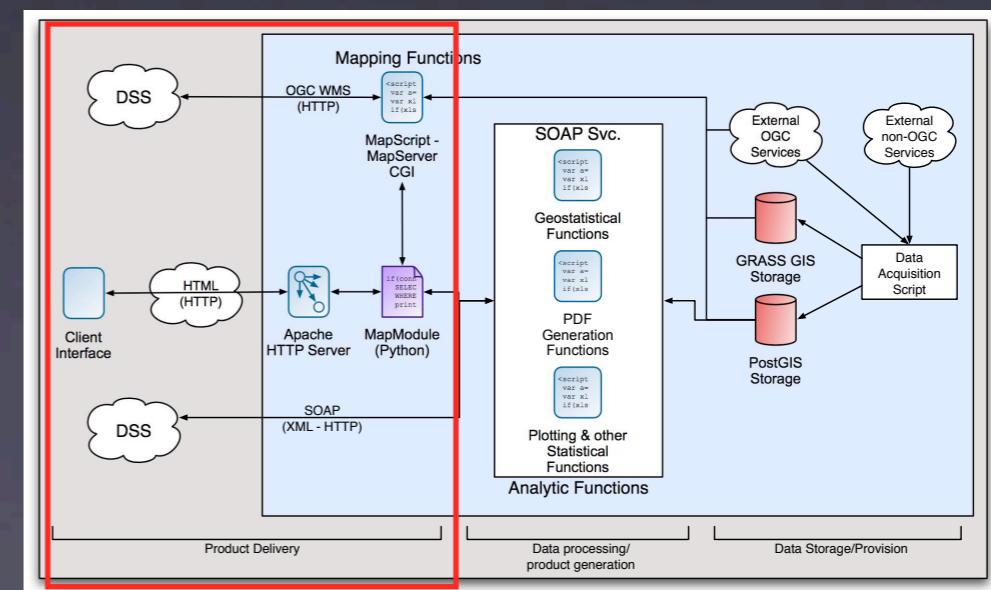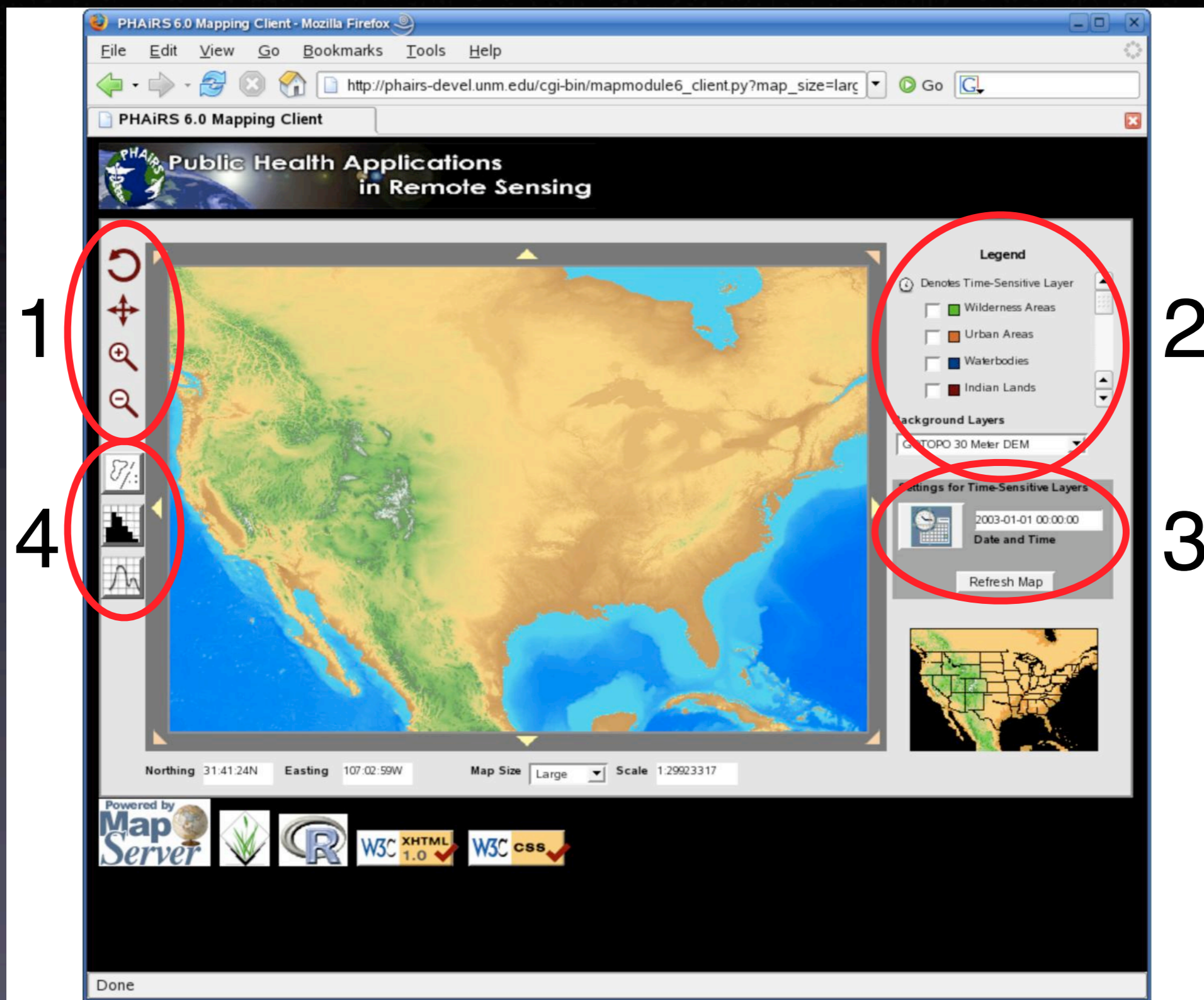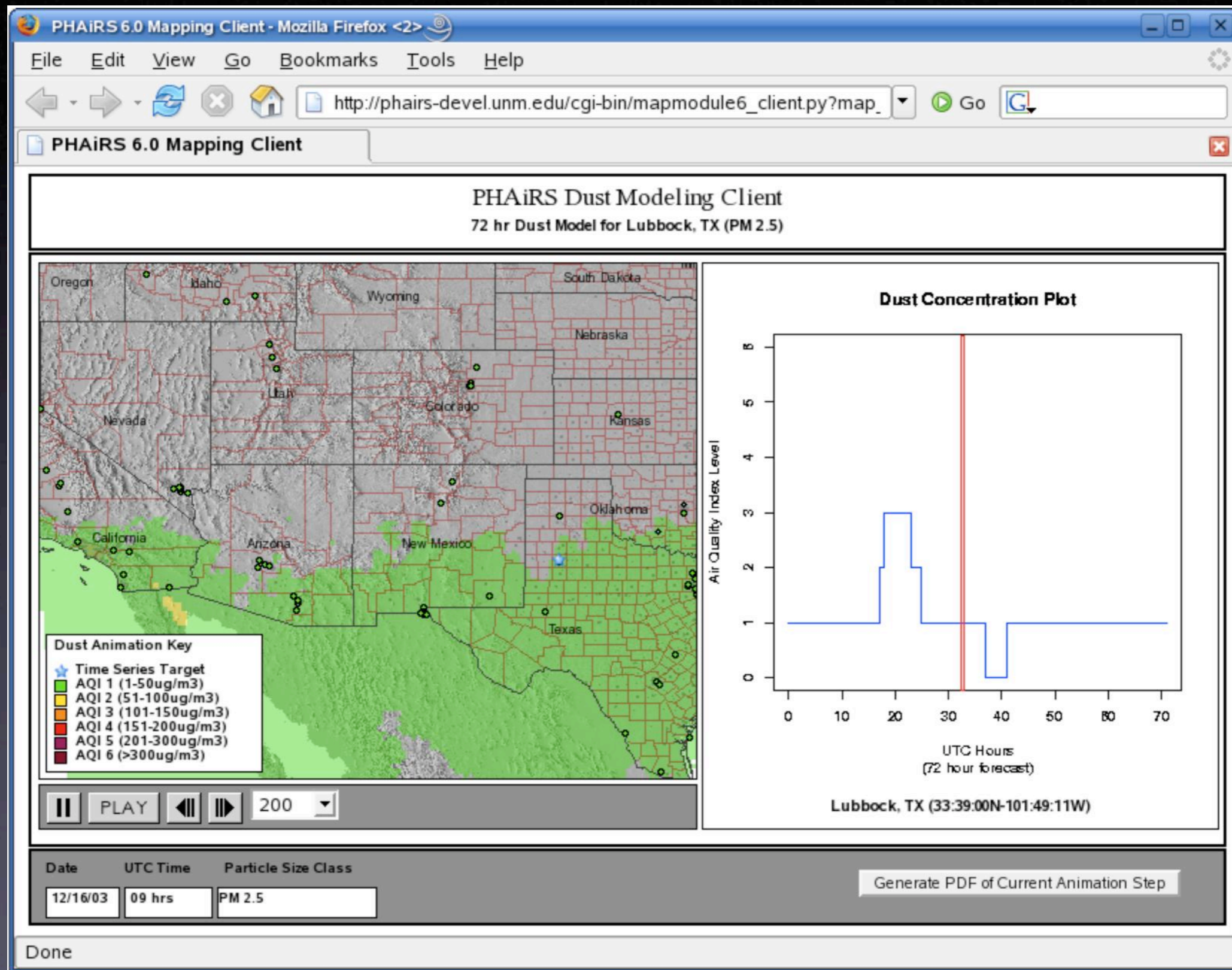
Time Series Client-Service Interaction
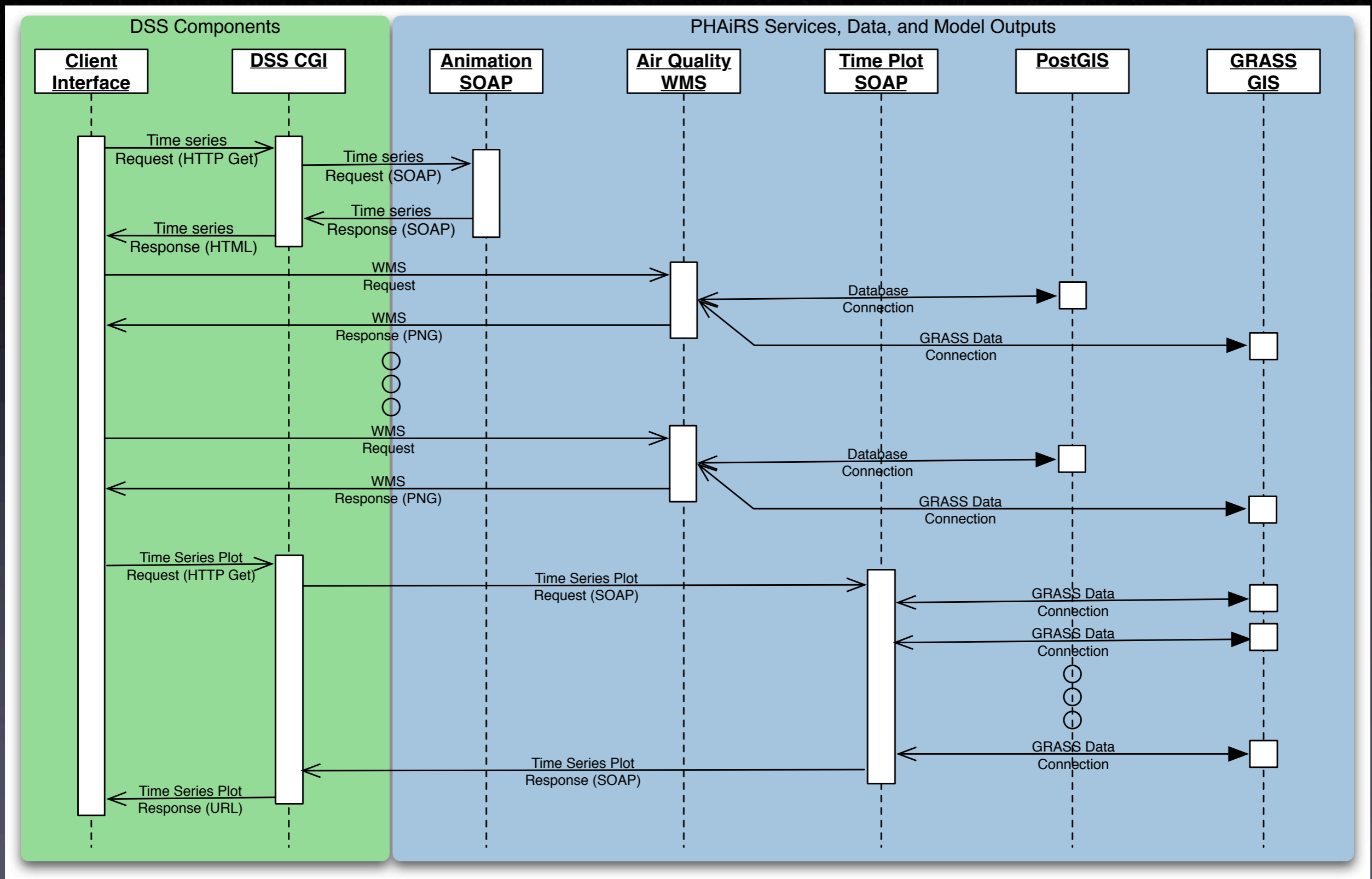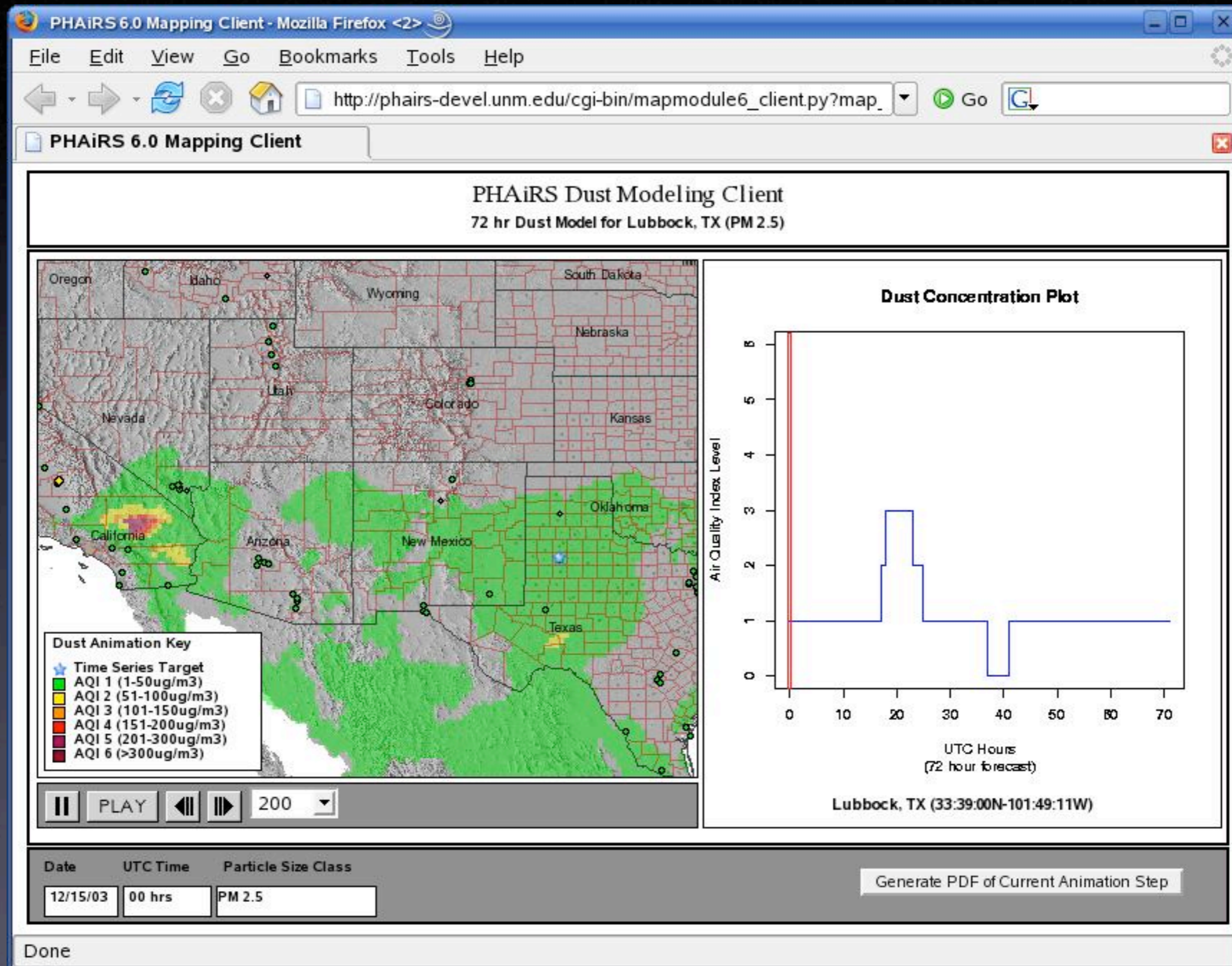
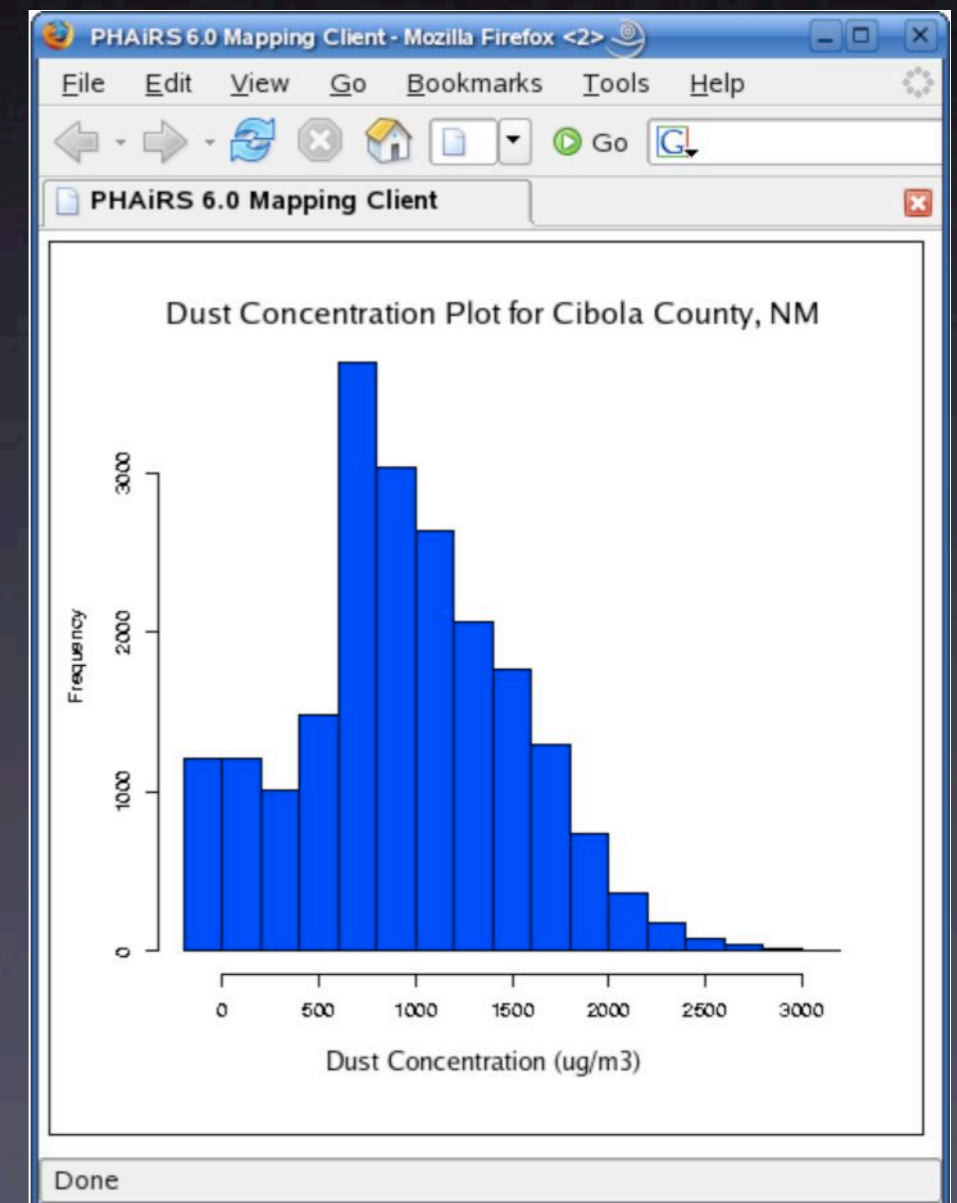# Density Plot Client-Service Interaction
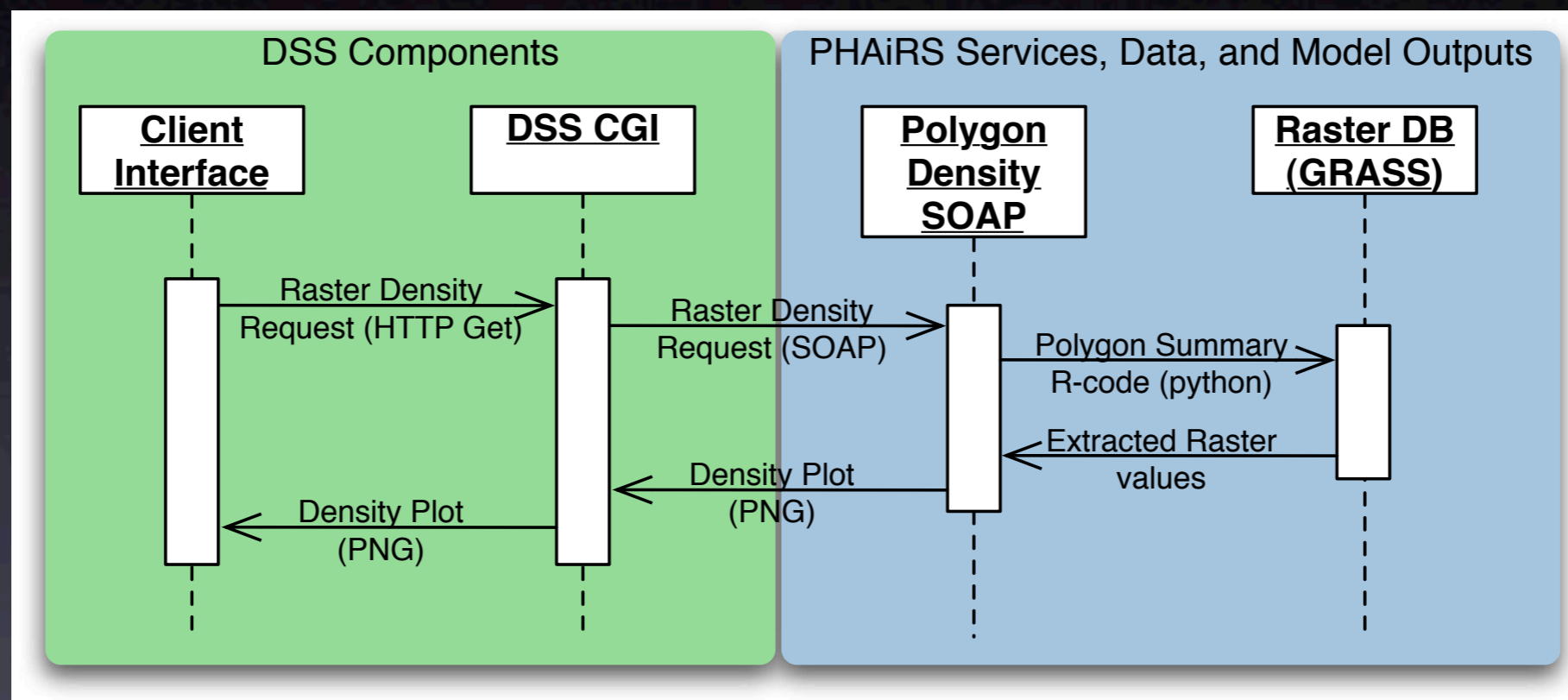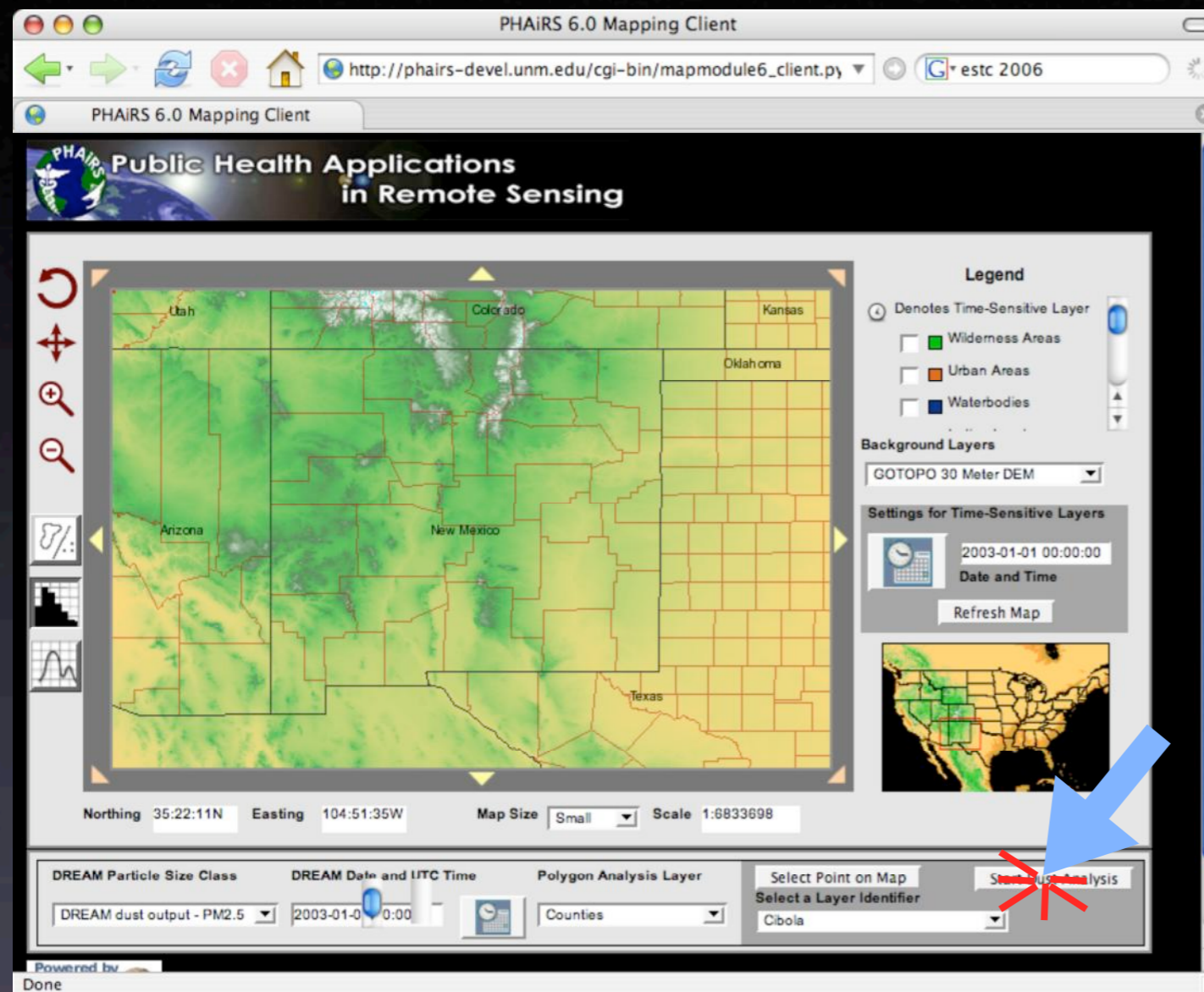
Demonstration Client Interface

Time Series Interface

Time Series Interface (movie)

Sample Density Plot

Public Health Applications in Remote Sensing

Future Plans

- Validation and Verification of regionalized DREAM model
  - ❖ Historic (2003-2006) particulate measurements already acquired for 84 AirNow stations in the model region
  - ❖ Historic Global Forecast System (GFS) data acquired for 8/05-present
  - ❖ Embarking on sequential model runs for comparison with EPA ground measurements
- Develop routine model run and result presentation capabilities
- Develop service metadata (WSDL)
- Work with DSS developers to deploy products into their systems (beta testers)

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Acknowledgments

- Project Partners
  - ❖ University of Arizona

- Collaborating Organizations
  - ❖ Sandia National Laboratories
  - ❖ ARES Corporation
  - ❖ Texas Tech Health Sciences Center